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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/599,027 | 06/22/2000 | Nagayoshi Ichikawa | 016887/0999 | 8692 |

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| EXAMINER |
|---|
| PALABRICA, RICARDO J |

| ART UNIT | PAPER NUMBER |
|---|---|
| 3641 | |

DATE MAILED: 01/14/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/599,027 | ICHIKAWA ET AL. | |
| | Examin r | Art Unit | |
| | Rick Palabrica | 3641 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the corr spond nce address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *02 October 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *10-15 and 17-25* is/are pending in the application.

4a) Of the above claim(s) *19-22* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10-15,17,18 and 23-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

1. Applicant's election of the following species, with traverse, in Paper No. 7 is acknowledged: a) corrosion potential producing material is a photocatalytic substance, as per claim 10; b) said substance is titanium dioxide; c) said substance is in the form of a solution or suspension and added to reactor water; d) nickel is the base material of the structural member; e) corrosion oxide film consists of inner and outer layers; f) outer layer is removed by chemical decontamination; g) control of reactor water is by hydrogen injection; and h) platinum is the surface material for the structural member.

2. The applicant alleges in said paper that it is inappropriate to require election of either nickel or iron for the base material of the structural member because examination of both species can be done without undue additional effort. The examiner disagrees because the type of corrosion oxide film that will be formed on the structural member depends on the base material type, as the applicant discloses in the specification. On page 13, lines 5-7, applicant discloses that the corrosion oxide film on the surface of a Ni-base alloy is a **p-type** semiconductor. On the other hand, the oxide formed on a Fe-base alloy, such as stainless steel, has an outer layer of **n-type** semiconductor and an inner layer of **p-type** semiconductor (page 13, lines 19-21). Said outer layer is removed by decontamination or increasing the hydrogen concentration in reactor water (page 13,

lines 22-26). Therefore, these two different types of base materials require different search and examination.

3. Based on the above-mentioned parts of the disclosure, it is interpreted that the corrosion oxide film for a Ni-base alloy consists of a single layer, whereas that for a Fe-base alloy consists of two layers, i.e., outer and inner. Therefore, the applicant election of nickel for the structural material is inconsistent with his election of two layers for the corrosion film. Accordingly, only those claims pertinent to nickel are considered proper for examination.

4. Claims 19, 20, 21 and 22 pertain to iron-based alloys and not to the elected nickel-based alloys. Therefore, these claims were not considered because they are not directed to the elected species (see MPEP Section 821).

5. Applicant's traversal is not found persuasive based on the reasons given above. The election requirement is still deemed proper and is therefore made FINAL.

***Specification***

6. The disclosure is objected to because of the following informalities:

- On page 4, line 4, the term; "noble meal" should be "noble metal"; on lines 33 and 34, the verb/subject agreement is incorrect.

- On page 5 and several other pages, the word "photocatalyst" is spelled incorrectly.
- On page 13, line 24, "rector water" should read, "reactor water."
- On page 16, line 9, what is the antecedent for "the amount of hydrogen?" Said amount has not been disclosed at this point
- On page 18, line 23, the term, "photoelectrochemical" is misspelled.
- On page 22, first paragraph, numeral 24 of Fig. 16, is not discussed

Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 10, 13, 14, 15 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,028,384 to Skarpelos et al. (see Fig. 1 and corresponding parts of the specification). Skarpelos discloses a method of repressing corrosion and enhancing personnel safety in the operation of a boiling water reactor comprising the steps of adding hydrogen (see Fig. 1, numeral 34) and inhibiting the conveyance of nitrogen compounds with the steam from the reactor pressure vessel by catalytic oxidation with titanium dioxide of any volatile nitrogen compounds carried with the

steam to non-volatile nitrogen compounds (see claim 9). Said titanium oxide is surfaced on a portion of the steam separator and/or dryer units, or other appropriate structure members within the reactor pressure vessel (see column 5, lines 5-10). The presence of said oxide on the surface of the reactor structural member will inherently reduce its corrosion potential. As to the limitation in claim 15 regarding the addition to the reactor water of a solution or suspension containing titanium oxide, Skarpelos discloses that his metal oxides can be applied in a variety of arrangements (see column 4, lines 60-64). One such method is by affixing a titanium oxide sponge in locations within the reactor pressure vessel to allow high surface contact with the evolving of flowing steam and any vapor entrained therewith (see column 5, lines 14-23). Said contact between the sponge and steam/vapor will inherently result in a titanium oxide solution or suspension being incorporated into the reactor water through the condenser and feedwater system.

8. Claims 10, 12, 13, 14, 17, 23 and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,715,290 to Uetake et al. Uetake discloses a method for providing reactor water control of a boiling water reactor that can effectively reduce radioactivity in the reactor water (see column 1, lines 56-60). Said method comprises continuing injection of iron and low solubility metal element in an initial stage of an operation cycle after loading new fuel rods until the sum thereof reaches a predetermined amount (see column 2, lines 9-13). Uetake also discloses that the low solubility metal may be Ti that forms a metal oxide layer, and the object of his invention

is achieved when the titanium oxide thickness is more than 10 microns (see column 2, lines 16-9 and column 3, lines 16-21). As to the limitation in claim 17 regarding a thickness of 0.1 to 1 micron, the applicant discloses in the specification on page 19, lines 13-19 that the corrosion potential levels off after the titanium oxide film increases beyond 1 micron, and that said film thickness **not smaller than 1 micron** reduces corrosion resistance effectively. Therefore, the titanium oxide thickness of 10 microns disclosed by Uetake inherently behaves in the same manner and produces the same effect as the thickness recited by the applicant.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 11 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uetake in view of U.S. Patent 5,602,888 to Hettiarachchi et al. As noted above, the Uetake reference shows the claimed invention with the exception of having a platinum surface on which titanium oxide forms, the injection of hydrogen through the feedwater system, and the specific mention of nickel base alloy for the structural member. Hettiarachchi discloses a method for protecting against stress corrosion cracking in a water-cooled reactor by injection of a noble metal, such as platinum in conjunction with hydrogen injection, which method reduces the electrochemical corrosion potential at the

surface of reactor components (see column 7, last paragraph and column 8, line 1-3). Reactor materials susceptible to said stress corrosion include carbon steel, alloy steel, stainless steel, **nickel-based,** cobalt-based , and zirconium-based alloys (see column 1, lines 37-40. The noble metal (i.e., platinum) compound decomposes under reactor thermal and radiation conditions to release ions/atoms of the noble metal which incorporate in or deposit on the oxide film formed on stainless steel and other alloy components. Therefore, it would have been obvious to one with ordinary skill in the art at the time the invention was made to appropriately modify the method, as disclosed by Uetake, by the method, as disclosed by Hettiarachchi, in order to achieve a method of suppressing corrosion of a nickel-based, reactor structural member comprising: 1) providing titanium dioxide in the form of solution or suspension into the reactor water; 2) forming said oxide on a surface on which platinum is provided; 3) controlling the iron concentration of the feedwater; and 4) injecting hydrogen in the feedwater.

10. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Skarpelos in view of German Patent 1997DE-1021080 to Henzel. As indicated in Section 6 of this Office Action, Skarpelos anticipates applicant claims relating to the use of titanium dioxide for the photocatalytic substance, its introduction into the reactor water as a solution or suspension and the introduction of hydrogen into the feedwater. Skarpelos does not provide details on the thickness of the titanium dioxide film. Henzel discloses a method of inhibiting corrosion of a nuclear component by oxidizing with

titanium oxide up to a thickness of 1 micron (see Abstract). Therefore, it would have been obvious to one with ordinary skill in the art at the time the invention was made to modify the method, as disclosed by Skarpelos, by the teaching in Henzel, to achieve a thickness of metal oxide that provides the same corrosion reduction as that thickness recited in the limitation of Claim 17.

***Conclusion***

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Reference D in PTO-892 and references A1 to A5 in the applicant's disclosure citation are cited as of interest because they pertain to the applicant's claims.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rick Palabrica whose telephone number is 703-306-5756. The examiner can normally be reached on 8:00-4:30, Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Carone can be reached on 703-306-4198. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-0285 for regular communications and 703-305-0285 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist, telephone number is 703-308-1113.

RJP
January 9, 2002

MICHAEL J. CARONE
SUPERVISORY PATENT EXAMINER